

Application Serial No. 09/677,478
Response to March 16, 2004 OA

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REMARKS

New claims 87-93 are added. Reconsideration of the application in view of the remarks to follow is requested.

Claims 21-28, 30, 32, 33, 58-61, 69-71, 82 and 86 are allowed.

Claims 67, 68, 78 and 79 are objected to as being dependent upon a rejected base claim.

Claims 1-3, 7, 10-13, 16-19, 62, and 80-81 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. (5,302,240) in view of Mori et al. (6,136,214). Claim 6 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. in view of Mori et al. and further in view of Barnes et al. (5,505,816). Claims 36-42, 44, 46, 72, and 83 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. in view of Mori et al. And further in view of Hong (6,103,070). Claims 47-48, 50, 53-57, 63-66, 73-77, and 84-85 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hori et al. in view of Mori et al. and further in view of Westendorp et al. (5,565,036).

Claim 1 recites etching a semiconductor wafer having a photoresist material thereon with a plasma etching material, and plasma etching using a gas effective to etch polymer from chamber internal surfaces and photoresist from the semiconductor wafer. That is, claim 1 recites to two plasma etches to the same semiconductor wafer. This claim is rejected by the combination of Hori and Mori with the Examiner relying on Hori to teach the two plasma etches (pgs.

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2-3 of paper no. 030604). However, the rejection is flawed inasmuch as the Examiner relies upon teachings of Hori which are directed to different examples of the same processing step. Stated another way, the rejection is flawed inasmuch as the Examiner relies upon teachings of Hori which are directed to two exclusive examples to allegedly disclose the plural plasma etches of a single or the same wafer as claimed. The first etch of col. 11 of Hori corresponds to processing of a first workpiece while the second etch of col. 31 pertains to a second exclusive example of processing a different workpiece. Hori is entirely devoid of any teaching or suggestion of combining the disparate plasma etching of different workpieces to disclose the plural etches of a single or same wafer recited in claim 1. Claim 1 recites two plasma etching steps to etch a wafer and thereafter to etch photoresist from the same previously etched wafer. Hori fails to teach or suggest plural plasma etches of a single or same wafer as defined in claim 1. Claim 1 is allowable for at least this reason.

More specifically, the entire disclosure of Hori is directed to improving patterning/dry etching underlying layers by not using photoresist as the mask directly on the underlying layers and instead using a carbon film between the underlying layers and photoresist to improve the aspect ratio of the patterns (see Background and Summary of the Invention). The balance of Hori's disclosure is generally directed to provide numerous exclusive and alternative examples for the **same processing step**, that is the same etch/pattern of an underlying layer

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is illustrated, wherein each example provides possibly a different underlying layer (e.g., insulative v. metal) and/or a different etching chemistry for different respective embodiments, and then Hori discloses examining the respective etching rates, shapes of etched patterns, and uniformity of the etch to the underlying layer (col. 10, Ins. 25-38; see the respective 14 examples).

That is, Hori teaches various exclusive examples of the same processing step wherein different dry etching chemistries are illustrated for different embodiments, and being the same processing step for exclusive examples, it is **inconceivable that the various examples are compatible in any combinable relationship**. Additionally, there is no teaching that any of the different examples are compatible for combining. Furthermore, Applicant submits that since each example teaches the same processing step, that is the underlying layer is patterned, the examples could not possibly be combined because the purpose or goal to pattern the underlying layer is reached in each example, and therefore, after the first example is performed, no other processing is needed to etch the underlying layer. However, to allegedly teach the two plasma etches recited in claim 1, the Examiner relies on the combination of no less than **three incompatible exclusive** examples referring to examples 1, 9 and 10 (pgs. 2-3 of paper no. 030604). Since the exclusive examples are not combinable, and Hori provides no teaching to combining the respective examples, it is inconceivable that a combination of examples disclosed by Hori teaches or

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suggests the two plasma etches recited in claim 1. Claim 1 is allowable.

Moreover regarding the rejection against claim 1, the Examiner correctly states that Hori fails to teach forming the polymer over at least some internal surfaces of a plasma etched chamber as positively recited in claim 1, and then relies on the teachings of Mori to allegedly provide the deficiency in teachings of Hori (pg. 3 of paper no. 030604). However, one skilled in the art with the teachings of Hori would never look to Mori for additional teachings. The Examiner is respectfully reminded that "[p]referably the Examiner's explanation should be such that it provides that impetus necessary to cause one skilled in the art to combine the teachings of the references to make the proposed modification." *Ex Parte Levengood*, 28 USPQ2d, 1300, 1301, Footnote 2, (Bd. Pat. App. and Inter. 1993) (citations omitted). Hori teaches RIE processing of layers over a substrate using perfluorocarbon gas (PFC), such as CF_4 and hydrofluorocarbon gas (HFC), such as CHF_3 (see respective examples 1, 9 and 10 for which the Examiner relies for teachings). However, the entire focus of Mori is to avoid using perfluorocarbon gases (PFC) and hydrofluorocarbon gases (HFC) stating: "As global environmental concerns are attracting growing attention, PFC and HFC are expected to be subjected to limited use or become difficult to obtain in the future because these gases easily absorb infrared rays, stay in atmosphere for as long as 3000 years and thus contribute greatly to the greenhouse effects on the earth" (col. 1, lns. 24-30). To resolve this problem,

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the invention of Mori is to use "[a] gas containing fluorine, but not carbon, is introduced into the reaction chamber where the fluorine-containing gas reacts with the solid carbon allowing the silicon oxide film and silicon nitride film to be selectively etched **without using PFC or HFC**" (col. 3, lns. 16-21) (emphasis added).

That is, the focus of Mori's invention is to avoid using perfluorocarbon gases (PFC) and hydrofluorocarbon gases (HFC) wherein Hori relies on such gases for etching. This is a clear "teaching away" and teaching away from the art is a *per se* demonstration of lack of obviousness. *In re Dow Chemical Co.*, 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988). One skilled in the art with the Hori teachings would have no motivation to look to Mori for teachings because Mori teaches to avoid the source gases that Hori depends on for etching. Accordingly, the Examiner simply has not provided that impetus necessary to cause one skilled in the art to combine the teachings of the references. Without an appropriate motivational rationale for combining the references, the obviousness rejection must fail. For all the above reasons, claim 1 is allowable over the combination of Hori and Mori.

Claims 2-3, 6-7, 62-66, 80 and 87 depend from independent claim 1, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

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For example, dependent claim 6 is rejected over the combination of Hori, Mori and Barnes. Claim 6 recites plasma etching using a gas effective to **etch polymer** from chamber internal surfaces **and photoresist** from the semiconductor wafer, the gas having a hydrogen component (from independent claim 1) that comprises NH₃. The Examiner correctly states that Hori and Mori do not teach the use of ammonia, and accordingly, relies on Barnes for such deficiency in teachings (pg. 4 of paper no. 030604). However, Barnes teaches the use of ammonia to **etch silicon dioxide** (col. 2 Ins. 20-35), and not polymer and photoresist as positively recited in claim 6. Accordingly, the combination of Hori, Mori and Barnes fails to teach a positively recited limitation of claim 6, and therefore, claim 6 is allowable.

Regarding the rejection of claim 10, the combination of Hori and Mori is improper because the entire focus of Mori is to avoid using perfluorocarbon gases (PFC) and hydrofluorocarbon gases (HFC) wherein Hori relies on such gases for etching. This is a clear "teaching away" and teaching away from the art is a *per se* demonstration of lack of obviousness. Consequently, the obviousness rejection against claim 10 based on Hori and Mori is improper and should be withdrawn. Claim 10 is allowable.

Claims 11-13, 16-19, 67-68, 81 and 88 depend from independent claim 10, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown

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or taught by the art of record.

Regarding the rejection against claim 36 based on the combination of Hori, Mori and Hong, such claim recites to a first plasma etching and a second plasma etching with the same wafer on a wafer receiver. The Examiner relies on inappropriate combination of examples in Hori to allegedly teach this recited limitation. Each example teaches the same processing step, that is the underlying layer is patterned, wherein the examples could not possibly be combined because the purpose or goal to pattern the underlying layer is reached in each example, and therefore, after the first example is performed, no other processing is needed to etch the underlying layer. Since the examples are not combinable, and Hori provides no teaching to combining the respective examples, it is inconceivable that a combination of examples disclosed by Hori teaches or suggests the two plasma etches recited in claim 36. Claim 36 is allowable.

Further regarding the rejection of claim 36, the combination of Hori and Mori is improper because the entire focus of Mori is to avoid using perfluorocarbon gases (PFC) and hydrofluorocarbon gases (HFC) wherein Hori relies on such gases for etching. This is a clear "teaching away" and teaching away from the art is a *per se* demonstration of lack of obviousness. Consequently, the obviousness rejection against claim 36 based on Hori and Mori is improper and should be withdrawn. Claim 36 is allowable.

Additionally, claim 36 recites a plasma etching method that comprises

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negatively biasing a wafer receiver to a range of 100 to 400 volts. The Examiner correctly states that Hori and Mori fail to teach such recited limitation, and then relies on the alleged teachings of Hong to provide the deficiency in teachings of Hori and Mori (page 8 of paper no. 030604). The motivational rationale provided by the Examiner was previously contested wherein the Examiner stated it as Hong states that pedestal bias voltage of a negative 30 is satisfactory and may range from negative 20 to a negative 100 volts (page 8 of paper 16). As stated in the previous response, this statement is completely devoid of any motivation to use the negative voltage teaching of Hong to modify the Hori and Mori inventions. The Examiner now responds stating that since both Hori and Hong are concerned with RF plasma etching, the two are appropriately combinable (pg. 16 of paper no. 030604). Applicant again submits this statement is devoid of that explanation such that it provides that impetus necessary to cause one skilled in the art to combine the teachings of the references to make the proposed modification, pursuant to the above authority. Additionally, respectfully, the Examiner is mistaken as to Hong being directed to plasma etching wherein the relied upon teaching of Hong is directed to a sputtering process for depositing, not plasma etching as positively recited in claim 36 (col. 10, Ins. 58-65). Consequently, the combination of art fails to teach a positively recited limitation of claim 36, and therefore, claim 36 is allowable.

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Claims 37-42, 44, 46, 72-74, 83 and 90 depend from independent claim 36, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

Regarding the rejection against claim 47 based on the combination of Hori, Mori and Westendrop, the Examiner **still has not addressed** the recited limitation to providing the electrostatic chuck at ground or floating potential. As stated in the previous response, the combination of art fails to teach providing the electrostatic chuck at ground or floating potential. In this present action (paper no. 030604), the Examiner provides the same alleged teaching of Hori to allegedly teach such limitation (pg. 10 of paper no. 030604), wherein Applicant demonstrated previously that Hori only teaches "to apply a bias potential to the substrate" (col. 34, lns. 35-40). However, a bias potential to the substrate is not a teaching to **ground or floating potential** to the electrostatic chuck as positively recited in claim 47. The Examiner did not address this deficiency in teachings in his "Response to Arguments." For at least this reason and the deficiencies of the art of record, claim 47 is allowable.

Additionally, claim 47 recites to a first plasma etching and a second plasma etching of a single or the same wafer. The Examiner relies on incompatible combination of examples in Hori to allegedly teach this recited limitation. Each example teaches the same processing step, that is the

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underlying layer is patterned, wherein the examples could not possibly be combined because the purpose or goal to pattern the underlying layer is reached in each example, and therefore, after the first example is performed, no other processing is needed to etch the underlying layer. Since the examples are not combinable, and Hori provides no teaching to combining the respective examples, it is inconceivable that a combination of examples disclosed by Hori teaches or suggests the two plasma etches recited in claim 47. Claim 47 is allowable.

Furthermore regarding the rejection of claim 47, the combination of Hori and Mori is improper because the entire focus of Mori is to avoid using perfluorocarbon gases (PFC) and hydrofluorocarbon gases (HFC) wherein Hori relies on such gases for etching. This is a clear "teaching away" and teaching away from the art is a *per se* demonstration of lack of obviousness. Consequently, the obviousness rejection against claim 47 based on Hori and Mori is improper and should be withdrawn. Claim 47 is allowable.

Claims 48-50, 53, 75-77, 84 and 91 depend from independent claim 47, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

Regarding the rejection against claim 54 based on the combination of Hori, Mori and Westendrop, the Examiner **still has not addressed** the recited limitation to providing the electrostatic chuck at ground or floating potential. As

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previously stated in the previous response, the combination of art fails to teach providing the electrostatic chuck at ground or floating potential. In this present action (paper no. 030604), the Examiner provides the same alleged teaching of Hori to allegedly teach such limitation (pg. 10 of paper no. 060304), wherein Applicant previously demonstrated that Hori only teaches "to apply a bias potential to the substrate" (col. 34, lns. 35-40). However, a bias potential to the substrate is not a teaching to **ground or floating potential** to the electrostatic chuck as positively recited in claim 54. The Examiner did not address this deficiency in teachings in his "Response to Arguments." For at least this reason, claim 54 is allowable.

Additionally, claim 54 recites to a first plasma etching and a second plasma etching of a single or the same wafer. The Examiner relies on incompatible combination of examples in Hori to allegedly teach this recited limitation. Each example teaches the same processing step, that is the underlying layer is patterned, wherein the examples could not possibly be combined because the purpose or goal to pattern the underlying layer is reached in each example, and therefore, after the first example is performed, no other processing is needed to etch the underlying layer. Since the examples are not combinable, and Hori provides no teaching to combining the respective examples, it is inconceivable that a combination of examples disclosed by Hori teaches or suggests the two plasma etches recited in claim 54. Claim 54 is allowable.

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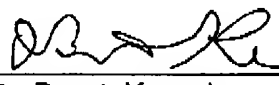
Furthermore regarding the rejection of claim 54, the combination of Hori and Mori is improper because the entire focus of Mori is to avoid using perfluorocarbon gases (PFC) and hydrofluorocarbon gases (HFC) wherein Hori relies on such gases for etching. This is a clear "teaching away" and teaching away from the art is a *per se* demonstration of lack of obviousness. Consequently, the obviousness rejection against claim 54 based on Hori and Mori is improper and should be withdrawn. Claim 54 is allowable.

Claims 55-57, 78-79, 85 and 92 depend from independent claim 54, and therefore, are allowable for the reasons discussed above with respect to the independent claim, as well as for their own recited features which are not shown or taught by the art of record.

This application is now believed to be in immediate condition for allowance, and action to that end is respectfully requested. If the Examiner's next anticipated action is to be anything other than a Notice of Allowance, the undersigned respectfully requests a telephone interview prior to issuance of any such subsequent action.

Respectfully submitted,

Dated: 7-16-04

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